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PREVENTION AND CONTROL OF PLAGUE

1. General. The return of prisoners of war from plague endemic areas to occupied territory, the repatriation of Japanese nationals, the movement of refugees within occupied areas and the extensive disruption of sanitary and housing facilities all act to make plague a disease worthy of major consideration in planning to protect the health of troops in this command. India and China are the world's important foci of the disease, but it is also found throughout southeastern Asia, in Java, and irregularly in other islands of the southwest Pacific.

Plague is transmitted from rat to rat and from rat to man by certain fleas. Infection may occur through rubbing into a bite flea feces that contain plague bacilli. It may result from the handling of infected rodents or tissue specimens obtained from them. Attendants caring for patients may contract the disease through contact with infective discharges from buboes or the respiratory tract. Technicians may be infected while examining diagnostic specimens.

2. Clinical Course. As a rule, the onset is sudden with high fever and extreme prostration, after an incubation period of 2 to 10 days. The severity of the disease is, however, variable, and mild unrecognized cases are dangerous sources of infection. In the typical case there is a marked tendency toward dehydration, with a rapid feeble pulse, and often mental clouding which may progress to delirium, convulsions, or coma. In fatal cases death usually takes place between the third and fifth day. When recovery occurs convalescence begins between the sixth and tenth days. Three clinical types are described but cases may show manifestations of all three, and it is probable that bacteremia is more common than the clinical picture of septicemia:

a. Bubonic. Characterized by enlargement, on second or third day, of lymph nodes draining the portal of entry. Pain may be severe. Buboes usually become soft and suppurate, the surround skin may become necrotic, with rupture of the bubo and dis-

charge of a thin fluid.

b. Pneumonic. Characterized by cough, thin bloody sputum, dyspnoea and diffusely scattered rales.

c. Septicemic. Characterized by immediate prostration and the development of superficial blebs, petechiae, purpuric spots and hemorrhages from various parts of the body. There may be generalized lymphadenopathy.

Prior to the use of sulfonamide therapy the case fatality rate was 30% or more in the bubonic type. Recovery was unusual in pneumonic and rare in septicemic cases. In a recent series of patients with positive blood cultures, reported from India, reduction of the mortality rate from 90.6% to 20.9% was achieved by use of sulfadiazine.

3. Diagnosis. The specific diagnosis of plague is made by stained smear, culture, or animal innoculation of infectious material from sputum, aspirated bubo contents, or blood. (See TM8-227) WARNING: ALL INFECTIOUS MATERIAL MUST BE HANDLED WITH THE GREATEST CARE.

4. Treatment. The patient must be put to bed immediately and strictly isolated. Good general medical and nursing care is essential. The total intake of fluids should be regulated to insure a daily urinary output of at least 1,500 cc. If necessary, fluid should be administered by vein. It is most important to initiate treatment with a sulfonamide without delay after the diagnosis has been established. Sulfadiazine is the drug of choice. Sulfathiazole may be used. Therapy must aim at high blood levels of from 15 to 20 mg. per 100 cc. during the first four or five days of the disease. Whenever possible, blood level determinations should be made at regular intervals and the dosage adjusted to maintain high levels. The initial dose by mouth should be 4.0 (60 grains), subsequent doses 1.5 to 2.0 gm. (22½ to 30 grains) every four hours day and night until temperature is normal. Then continue with 0.5 gm. (7½ grains) every four hours for at least ten to fifteen days after the temperature is normal. A gradual reduction in the blood level to 10 to 15 mg. per 100 cc. is indicated when the patient shows improvement. In fulminating cases or when treatment has been delayed, sodium sulfadiazine (5 per cent solution in sterile distilled water) should be given intravenously: initial dose, 6 to 8 gm.(90 to 120 grains), given slowly; subsequent doses, 3 or 4 gm. every six hours. Change to oral dosage as soon as possible. Sodium bicarbonate, 3 grams every four hours, should be given throughout the course of sulfadiazine in order to prevent renal complications associated with crystalluria by providing an alkaline urine. Penicillin is ineffective in the treatment of plague. No therapeutic serium is available at present. Hot, wet applications to buboes may be helpful. Incision should be delayed until localization is complete in order to avoid blood stream infection.

5. Preventive Measures in Advance of Known Infection, in Areas Subject to Plague.

a. Immunization. All military personnel in occupied areas should be immunized with plague vaccine. The initial vaccination consists of two subcutaneous injections of plague vaccine with an interval of 7 to 10 days between injections. The first dose is 0.5 cc. and the second 1.0 cc. of vaccine.

b. Use of Insecticide Powder. Insecticide, powder, louse, DDT, 2 ounce can (QM Stock No. 51-I-173) will be provided for each man. Whenever clothing is changed, or at weekly intervals if the same clothing must be worn for a longer period, DDT powder should be applied to the underclothing and inner surfaces of shirt and trousers in order to insure freedom from fleas. Inspection of troops and quarters for fleas should be held every two weeks.

c. Rodent Control. Personnel of units in occupied areas (Par. 4c, Cir. 42, GHQ, AFPAC, 14 August 1945, "Control of Malaria and Insect-Borne Diseases") will be trained in flea and rodent control in accordance with Training Memorandum No. 2, GHQ, AFPAC, 14 August 1945. Surveys of unit areas and necessary flea and rat eradication programs should be initiated by all unit commanders. In cities, especially ports, of each occupied area a systematic, continuous sampling survey of rats will be carried on by live trapping. The flea index of the rats will be noted, and the rats examined for evidence of plague. Any rats found dead will be collected and examined for plague..

d. Medical Intelligence. Close Liaison should be maintained by unit surgeons with local military government and civilian public health authorities to assure early information of the presence of plague.

e. Supply. Timely requisition must be made of essential plague control supplies: rodenticides, traps, insecticides and bulk dimethylphthalate.

6. Control Measures - First Appearance of Plague in Occupied Area.

a. Diagnosis. It is important to recognize sporadic cases. This diagnosis should be suspected on epidemiological grounds and confirmed by specific laboratory procedures. (See Par. 3 above)

b. Isolation of Patients. An isolation hospital for civilian cases should be established. Patients should be kept in separate screened rooms and only attendants allowed to enter. Attendants of pneumonic or suspected pneumonic cases must wear hoods with goggles or plastic eye openings, coveralls, or complete gown with

trousers, and rubber gloves. All waste articles contaminated by discharges are burned. Bedding, linens and utensils in contact with the patient should be sterilized by boiling or autoclaving. When a room is vacated the walls, floor and furniture should be disinfected by washing with 5 percent solution of compound cresol and the room allowed to air for 48 hours. Persons handling the bodies of patients who have died of plague should observe strict isolation technique.

c. Area Quarantine.

(1) Civilian communities where an infection has occurred or may have occurred should be placed off limits to troops until the danger is past. An armed traffic patrol should be placed on all roads passing through the infected community to enforce the off limits regulation and to assure that civilians necessarily entering the infected area are disinfested with insecticide powder prior to entry and on exit therefrom. Provision for such disinfestation should be maintained at road blocks. Military personnel entering or leaving an infected area on essential military duty should be disinfested by dusting with DDT powder. The common tendency of inhabitants of a plague infected town to flee to the country or to neighboring villages must be curbed, forcibly if necessary. Incubating the disease or carrying infected fleas, those refugees tend to spread the disease widely.

(2) Contacts and suspected contacts of a patient with pneumonic plague should be disinfested and segregated. Their temperatures should be taken every 12 hours for ten days, and any such person developing fever should be isolated, regardless of the apparent cause of fever. Close contact with segregated persons should be avoided. Inspecting personnel must wear gowns, coveralls, caps, masks and rubber gloves, and should be dusted daily with insecticide powder.

d. Foreign Quarantine.

(1) Personnel departing from plague areas should be certified as free from plague infection, and the statement made that their clothing and equipment are vermin free. Procedures necessary to give assurance of their condition, including inspection and delousing when indicated, should be carried out within 48 hours prior to departure.

(2) Vessels having contact with ports in plague areas should be protected against the entry of rats. This may be accomplished by use of rat-free wharves, by lighterage, or by fending off from wharves. If a vessel is laid alongside a wharf there must be adequate rat-guards on all lines, and policing of cargo nets and gang planks. At night nets and gang planks should be lighted brilliantly.

(3) Steps should be taken to assure that cargo taken on is free from rats.

(4) Rat trapping should be continuous on vessels, especially those having contact with plague ports. Vessels should be subjected to inspection and/or fumigation by quarantine authorities at the non-plague port of entry.

e. Flea Control. Control of plague in a civilian community is based upon the premise that the plague infected flea is the primary agent in transmitting the disease to man, the rat beingof secondary importance as the source of infection for the flea.

(1) Focal disinfestation. It is wasteful of effort and efficiency to attempt to rid entire towns or cities of fleas. The attack should center around known infected foci, houses or buildings where cases of plague have developed. Having described a circle with a radius of 100 yards from the focal point all persons and things within that area, starting peripherally and working toward the center, should be disinfested. Persons should be thoroughly dusted with DDT powder as described in Circular Letter 44, Office of the Chief Surgeon, GHQ, AFPAC, dated 26 October 1945, Par. 2d and 3c. Pets and domestic animals should be thoroughly dusted with DDT powder. Clothing, bedding and furniture should be thoroughly dusted. Walls, ceilings and floors are to be sprayed with DDT residual spray, making sure that any cracks receive especial attention. Rat runs should be heavily powdered with DDT dust and it should be blown down rat holes and into rat harborages. For dusting, as described above, either QM Item No. 51-I-180 or 51-L-122 may be used, applied at the rate of 1 lb. per sq. ft. of flat surface. Insecticide, spray, DDT, residual effect (QM Item No. 51-I-305) should be applied at the rate of 1 quart per 250 sq. ft.

(2) Other measures indicated. Rat trapping lines should be run radially beyond the focal zone. If plague rats or rats with a high flea index are discovered the disinfestation process should be repeated, again proceeding inward from the outermost point of suspected

infestation. Military and civilian personnel engaged in plague control should apply insect repellent to exposed skin in the manner prescribed for mosquitoes. While repellents do not prevent fleas from alighting, the fleas leave the treated surface almost immediately and do not bite. Clothing, including socks, should be impregnated with dimethylphthalate QM Item No. 51-R-300, Repellent, insect, clothing treatment or QM Item No. 51-R-265, Repellent, insect, 2 oz. bottle. (If the 2 ounce bottle of insect repellent is used care must be taken that the particular issue is pure dimethylphthalate, since this item number includes also indalone, Formula 612, and 6-6-2 mixture, which are not as effective). It is important that trousers should be tucked into boots or leggings. Military personnel within or adjacent to a plague infected area should be disinfested weekly with 10% DDT powder applied by hand or power duster.

Hospitals, barracks, mess halls and storerooms of military installations within or adjacent to a plague infected area should be kept free of fleas by use of DDT powder or residual spray. Rat harborages should receive special attention.

f. Rodent Control. When human plague is discovered, the extent of the disease in the rodent population should be determined by trapping in every direction from the focus of infection until no additional infected animals are found. As soon as focal disinfestation is complete a rat extermination program should be instituted, again working from the periphery toward the point of infection. Rats should be killed by trapping, poisoning and fumigation, buildings and shipps should be rat-proofed, rat harborages should be destroyed, and trash piles cleaned up. Food supplies should be carefully protected against the access of rats, and attention given to the collection and disposal of garbage.

g. Immunization. All American military personnel within the general area of infection should receive a stimulating dose of 1.0 cc. of plague vaccine.

h. Natives on Military Posts. Natives from a town or village where cases of plague are occurring should not be admitted within army unit areas. The number of natives employed within the military installation should be reduced to a minimum, and they should be required to live on the post. If this is impractical, they and their quarters should be disinfested, and signs of febrile illness sought for each day when they report for duty. Such personnel should be immunized against plague.

7. Control of Plague - Declared Epidemic. Full use should be made of Army or Corps case finding teams if available. (These will

normally consist of one Medical Corps Officer and two enlisted men, including one NCO trained in clinical and laboratory diagnosis. They are set up to insure the early detection of civilian cases.) Disinfestation and rodent control teams are provided for in Par. 4b (2), Circular No. 42, GHQ AFPAC, 14 August 1945, and will be composed of especially trained Malaria Control personnel.

a. Operation of Epidemic Case Finding Teams.

(1) Make epidemiologic case studies of all reported cases of plague or suspected plague, with special attention toward determining sources of infection and identification of contacts.

(2) Initiate preliminary and emergency control measures in each case of suspected or confirmed plague, to include action for removal of patient to hospital, disinfestation of patient and immediate contacts, and of the patient's immediate environment.

(3) Organize and augment house to house case finding in the infected community, using civilian personnel to the fullest extent.

(4) Assure immunization and disinfestation of all civilian personnel engaged in plague control.

(5) Consult and aid in provision of adequate isolation measures for patients in civilian hospitals.

b. Operation of Disinfestation and Rodent Control Teams.

(1) Disinfest all buildings and the people inhabiting them within a 100 yard radius from a house in which plague is reported.

(2) Survey the infected community and immediate surrounding area for rodent population.

(3) Direct and aid in carrying out a program for rat extermination in the infected community and in nearby military establishments.

(4) Organize facilities for disinfestation by dusting at road blocks outside infected communities.

/s/ Guy B. Denit
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